

Customer: Air Liquide
Item No./Item Name: W21001
Chart Sales Order 509.1-1
Date: 01/31/05

By :Ken Rupp, Senior Principal Quality Engineer

1. Scope

This is to report the inspection results of the brazed core for the following project.

Customer: Air Liquide
Sales Order: 509.1-1
Item Number: W21001

<u>Item</u>	<u>Item No.</u>	<u>Sales Order</u>	<u>Modules</u>	<u>Number of Core</u>
Heat Exchanger	W21001	509.1-1	1&2	1

2. Reference Specification

AL WGS.3.1.1 Rev. A

3. Inspection items

3.1 Side Plate deflection

3.2 Fin crushing
All layers in top and bottom of each layer have been measured.

3.3 Light check for W21001
All layers have been checked with light to verify no plugging of oxygen layers.

3.4 Fin gap measurements for W21001
The gaps between the pad in oxygen layers have been checked with 1 mm diameter stainless steel tie rod to verify more than 2 mm gap

4. Inspection results

Please refer to the inspection records as attached.

Submitted by:

A handwritten signature in black ink, appearing to read "Ken Rupp".

Ken Rupp
Senior Principal Quality Engineer



Customer: Air Liquide
 Item No./Item Name: W21001
 Chart Sales Order 509.1-1
 Date: 01/31/05
 By :Ken Rupp, Senior Principal Quality Engineer

3.1 Depression of Side Plate – the top deflector of side plate after Br shall not exceed $1/150 \times$ stack height. When exceeded, measure fin crushing.

Crown/Concavity Measurements Module #1		Crown/Concavity Measurements Module #2	
1	+4.8	1	+5.33
2	+4.8	2	+3.3

3.2 Fin Crushing – fin crushing shall not exceed $0.16H_f$. H_f . Height of the Fin

Module #1 Inlet		Module #1 Outlet		Module #2 Inlet		Module #2 Outlet	
Layer #	mm	Layer #	mm	Layer #	mm	Layer #	mm
2	0	2	0.03	2	0.08	2	0.03
4	0	4	0	4	0.05	4	0
6	0	6	0.18	6	0.03	6	0
8	0	8	0.21	8	0.05	8	0
10	0.05	10	0	10	0.05	10	0
142	0.08	142	0	142	0	142	0
144	0.11	144	0	144	0.05	144	0
146	0.03	146	0.03	146	0.05	146	0.03
148	0.03	148	0	148	0.03	148	0.03
150	0.08	150	0	150	0.08	150	0.03

Light Completed and the results were satisfactory.

3.3 Light Check for W21001 – all layers have been checked with light to verify no plugging of oxygen layers.



Customer: Air Liquide
 Item No./Item Name: W21001
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3.4 Fin Gap Measurements

Module 1 Fin Gap Measurements									
Layer #	Gap 1	Gap 2	Gap 3	Gap 4	Layer #	Gap 1	Gap 2	Gap 3	Gap 4
	mm	mm	mm	mm		mm	mm	mm	mm
2	6.4	6.4	6.4	6.4	78	6.4	6.4	6.4	6.4
4	6.4	6.4	6.4	6.4	80	6.4	6.4	6.4	6.4
6	6.4	6.4	7.9	4.8	82	6.4	6.4	6.4	6.4
8	6.4	6.4	6.4	6.4	84	6.4	6.4	6.3	6.4
10	6.4	6.4	6.4	6.4	86	6.4	6.4	6.4	6.4
12	6.4	6.4	6.4	6.4	88	6.4	6.4	6.4	6.4
14	5.3	6.4	7.4	6.4	90	6.4	6.4	6.4	6.4
16	6.4	4.8	9.4	4.8	92	6.4	6.4	6.4	6.4
18	6.4	6.4	6.4	6.4	94	6.4	6.4	6.4	6.4
20	6.4	6.4	6.4	6.4	96	6.4	6.4	6.4	6.4
22	6.4	6.4	6.4	6.4	98	6.4	6.4	6.4	6.4
24	6.4	6.4	6.4	6.4	100	6.4	6.4	6.4	6.4
26	6.4	6.4	6.4	6.4	102	6.4	6.4	6.4	6.4
28	6.4	6.4	6.4	6.4	104	6.4	6.4	6.4	6.4
30	5.3	6.4	7.4	6.4	106	4.8	6.4	7.9	6.4
32	6.4	6.4	6.4	6.4	108	6.4	6.4	6.4	6.4
34	6.4	6.4	6.4	6.4	110	6.4	6.4	6.4	6.4
36	6.4	6.4	6.4	6.4	112	6.4	6.4	6.4	6.4
38	4.8	6.4	7.9	6.4	114	6.4	6.4	6.4	6.4
40	6.4	6.4	6.4	6.4	116	6.4	6.4	6.4	6.4
42	6.4	6.4	6.4	6.4	118	6.4	6.4	6.4	6.4
44	6.4	6.4	6.4	6.4	120	6.4	6.4	6.4	6.4
46	6.4	6.4	6.4	6.4	122	6.4	6.4	6.4	6.4
48	6.4	6.4	6.4	6.4	124	6.4	6.4	6.4	6.4
50	6.4	6.4	6.4	6.4	126	6.4	6.4	6.4	6.4
52	6.4	6.4	6.4	6.4	128	6.4	6.4	6.4	6.4
54	6.4	6.4	6.4	6.4	130	6.4	6.4	6.4	6.4
56	6.4	6.4	6.4	6.4	132	6.4	6.4	6.4	6.4
58	6.4	4.8	7.9	6.4	134	6.4	6.4	6.4	6.4
60	6.4	6.4	6.4	6.4	136	6.4	6.4	6.4	6.4
62	6.4	6.4	6.4	6.4	138	6.4	6.4	6.3	6.4
64	6.4	6.4	6.4	6.4	140	6.4	6.4	6.4	6.4
66	4.8	6.4	7.9	6.4	142	6.4	6.4	6.4	6.4
68	6.4	6.4	6.4	6.4	144	6.4	6.4	6.4	6.4
70	6.4	6.4	6.4	6.4	146	6.4	6.4	6.4	6.4
72	6.4	6.4	6.4	6.4	148	6.4	6.4	6.4	6.4
74	6.4	6.4	6.4	6.4	150	6.4	6.4	6.4	6.4
76	6.4	6.4	6.4	6.4					



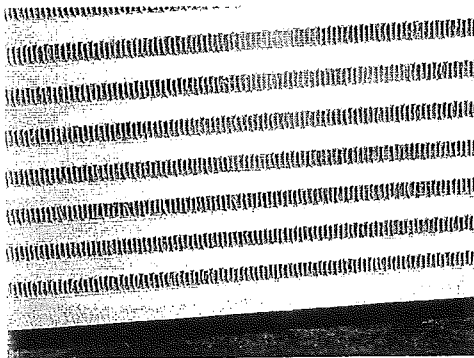
Customer: Air Liquide
Item No./Item Name: W21001
Chart Sales Order 509.1-1
Date: 01/31/05

By :Ken Rupp, Senior Principal Quality Engineer

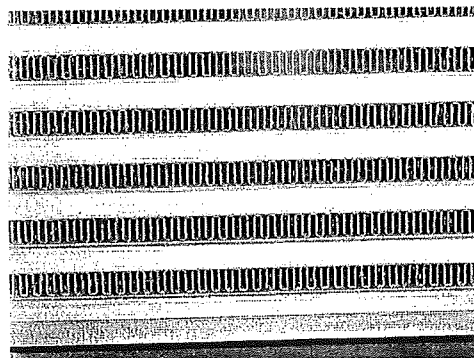
Module 2 Fin Gap Measurements									
Layer #	Gap 1	Gap 2	Gap 3	Gap 4	Layer #	Gap 1	Gap 2	Gap 3	Gap 4
	mm	mm	mm	mm		mm	mm	mm	mm
2	6.4	6.4	6.3	6.4	78	6.4	6.4	6.4	6.4
4	6.4	6.4	6.4	6.4	80	6.4	6.4	6.4	6.4
6	6.4	6.4	6.4	6.4	82	6.4	6.4	6.4	6.4
8	6.4	6.4	6.4	6.4	84	6.4	6.4	6.4	6.4
10	6.4	6.4	6.4	6.4	86	6.4	6.4	6.4	6.4
12	6.4	6.4	6.4	6.4	88	6.4	6.4	6.4	6.4
14	6.4	6.4	6.4	6.4	90	6.4	6.4	6.4	6.4
16	6.4	6.4	6.3	6.4	92	6.4	6.4	6.4	6.4
18	4.8	6.4	7.9	6.4	94	6.4	6.4	6.4	6.4
20	6.4	6.4	6.4	6.4	96	6.4	6.4	6.4	6.4
22	6.4	6.4	6.4	6.4	98	6.4	6.4	6.4	6.4
24	6.4	6.4	6.4	6.4	100	6.4	6.4	7.9	4.8
26	6.4	6.4	6.4	6.4	102	6.4	6.4	6.4	6.4
28	6.4	6.4	6.4	6.4	104	6.4	6.4	6.4	6.4
30	6.4	6.4	6.4	6.4	106	6.4	6.4	6.4	6.4
32	6.4	6.4	6.4	6.4	108	6.4	6.4	6.4	6.4
34	6.4	6.4	6.4	6.4	110	6.4	6.4	6.4	6.4
36	6.4	6.4	6.4	6.4	112	6.4	6.4	6.4	6.4
38	6.4	6.4	6.4	6.4	114	6.4	6.4	6.4	6.4
40	6.4	6.4	6.4	6.4	116	6.4	6.4	6.3	6.4
42	6.4	6.4	6.4	6.4	118	6.4	6.4	6.3	6.4
44	6.4	6.4	6.4	6.4	120	6.4	6.4	6.4	6.4
46	6.4	6.4	6.4	6.4	122	6.4	6.4	6.4	6.4
48	6.4	6.4	6.4	6.4	124	6.4	6.4	6.4	6.4
50	4.8	6.4	7.9	6.4	126	6.4	6.4	6.4	6.4
52	6.4	6.4	6.4	6.4	128	6.4	6.4	6.4	6.4
54	6.4	6.4	6.4	6.4	130	6.4	6.4	6.4	6.4
56	6.4	6.4	6.4	6.4	132	6.4	6.4	6.4	6.4
58	6.4	6.4	6.4	6.4	134	6.4	6.4	7.9	4.8
60	6.4	6.4	6.3	6.4	136	6.4	6.4	6.4	6.4
62	6.4	6.4	6.4	6.4	138	6.4	6.4	6.4	6.4
64	6.4	6.4	6.4	6.4	140	6.4	6.4	6.4	6.4
66	6.4	6.4	7.9	4.8	142	6.4	6.4	6.4	6.4
68	6.4	6.4	6.4	6.4	144	6.4	6.4	6.3	6.4
70	6.4	6.4	6.4	6.4	146	6.4	6.4	6.4	6.4
72	6.4	6.4	6.4	6.4	148	6.4	6.4	6.4	6.4
74	6.4	6.4	6.4	6.4	150	6.4	6.4	6.4	6.4
76	6.4	6.4	6.4	6.4					



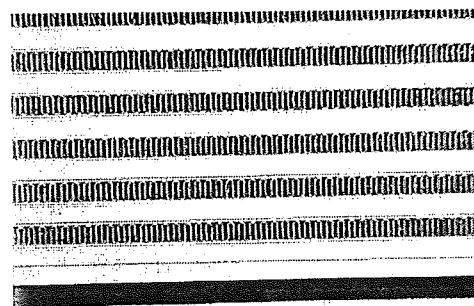
Customer: Air Liquide
Item No./Item Name: W21001
Chart Sales Order 509.1-1
Date: 01/31/05
By :Ken Rupp, Senior Principal Quality Engineer



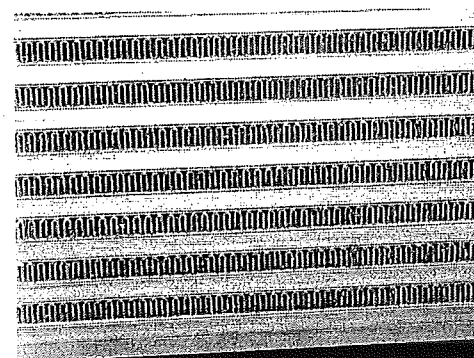
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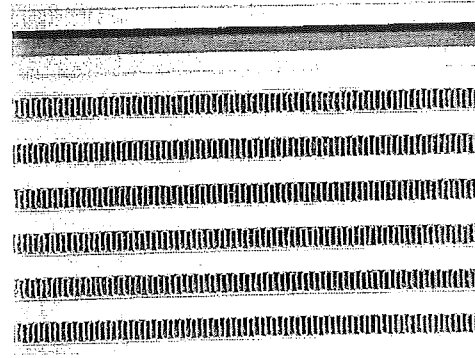
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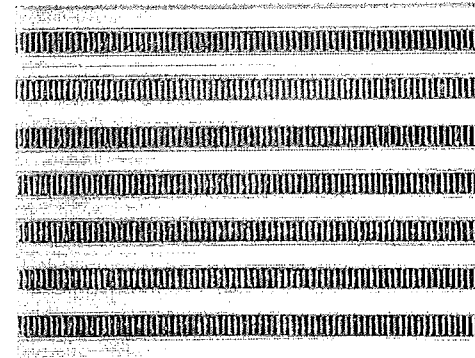
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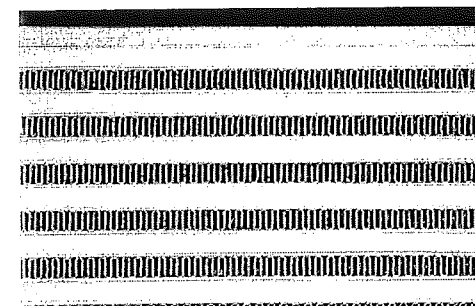
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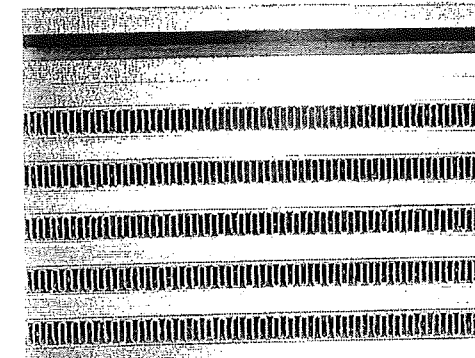
Mod 1 In Top



Mod 1 Out Top



Mod 2 In Top



Mod 2 Out Top



Customer: Air Liquide
Item No./Item Name: W21001
Chart Sales Order 509.1-2
Date: 01/31/05

By :Ken Rupp, Senior Principal Quality Engineer

1. Scope

This is to report the inspection results of the brazed core for the following project.

Customer: Air Liquide
Sales Order: 509.1-2
Item Number: W21001

<u>Item</u>	<u>Item No.</u>	<u>Sales Order</u>	<u>Modules</u>	<u>Number of Core</u>
Heat Exchanger	W21001	509.1-2	3&4	1

2. Reference Specification

AL WGS.3.1.1 Rev. A

3. Inspection items

3.1 Side Plate deflection

3.2 Fin crushing
All layers in top and bottom of each layer have been measured.


3.3 Light check for W21001
All layers have been checked with light to verify no plugging of oxygen layers.

3.4 Fin gap measurements for W21001
The gaps between the pad in oxygen layers have been checked with 1 mm diameter stainless steel tie rod to verify more than 2 mm gap

4. Inspection results

Please refer to the inspection records as attached.

Submitted by:


Ken Rupp
Senior Principal Quality Engineer



Customer: Air Liquide
 Item No./Item Name: W21001
 Chart Sales Order 509.1-2
 Date: 01/31/05

By :Ken Rupp, Senior Principal Quality Engineer

3.1 Depression of Side Plate – the top deflector of side plate after Br shall not exceed $1/150 \times$ stack height. When exceeded, measure fin crushing.

Crown/Concavity Measurements Module #3		Crown/Concavity Measurements Module #4	
1	+3.81	1	+3.04
2	+3.81	2	+3.3

3.2 Fin Crushing – fin crushing shall not exceed $0.16H_f$. H_f . Height of the Fin

Module #3 Inlet		Module #3 Outlet		Module #4 Inlet		Module #4 Outlet	
Layer #	mm	Layer #	mm	Layer #	mm	Layer #	mm
2	0.25	2	0.05	2	0	2	0.05
4	0.08	4	0	4	0	4	0
6	0	6	0	6	0.03	6	0
8	0.05	8	0	8	0	8	0
10	0.07	10	0	10	0	10	0.03
142	0	142	0.1	142	0	142	0.03
144	0.03	144	0.1	144	0	144	0.03
146	0	146	0.03	146	0	146	0.05
148	0	148	0.02	148	0	148	0
150	0	150	0	150	0	150	0

Light Completed and the results were satisfactory.

3.3 Light Check for W21001 – all layers have been checked with light to verify no plugging of oxygen layers.



Customer: Air Liquide
Item No./Item Name: W21001
Chart Sales Order 509.1-2
Date: 01/31/05

By :Ken Rupp, Senior Principal Quality Engineer

3.4 Fin Gap Measurements

Module 3 Fin Gap Measurements									
Layer #	Gap 1	Gap 2	Gap 3	Gap 4	Layer #	Gap 1	Gap 2	Gap 3	Gap 4
	mm	mm	mm	mm		mm	mm	mm	mm
2	6.4	6.4	6.4	6.4	78	6.4	7.9	4.8	6.4
4	6.4	5.6	5.6	7.9	80	6.4	5.6	7.1	6.4
6	6.4	5.6	6.4	7.1	82	6.4	6.4	6.4	6.4
8	6.4	5.6	6.4	7.1	84	6.4	6.4	6.4	6.4
10	7.9	3.3	7.9	6.4	86	6.4	7.1	5.6	6.4
12	6.4	5.6	5.6	7.9	88	6.4	5.6	6.4	7.1
14	6.4	4.1	7.1	7.9	90	6.4	7.9	4.8	6.4
16	7.9	3.3	6.4	7.9	92	6.4	6.4	4.8	7.9
18	6.4	4.1	7.1	7.9	94	6.4	5.6	7.1	6.4
20	6.4	6.4	7.1	5.6	96	7.9	4.8	6.4	6.4
22	6.4	4.8	7.9	6.4	98	6.4	6.4	6.4	6.4
24	6.4	4.8	7.1	7.1	100	6.4	7.1	5.6	6.4
26	6.4	4.8	7.9	6.4	102	6.4	5.6	7.1	6.4
28	6.4	7.1	4.8	7.1	104	7.9	4.8	6.4	6.4
30	6.4	6.4	6.4	6.4	106	6.4	7.9	6.4	4.8
32	6.4	6.4	6.4	6.4	108	6.4	6.4	7.1	5.6
34	6.4	4.8	6.4	7.9	110	6.4	7.1	7.1	4.8
36	6.4	4.1	7.1	7.9	112	6.4	6.4	6.4	6.4
38	6.4	4.8	6.4	7.9	114	6.4	7.1	6.4	5.6
40	6.4	6.4	4.8	7.9	116	6.4	9.7	6.4	3.0
42	6.4	5.6	5.6	7.9	118	6.4	6.4	7.9	4.8
44	6.4	7.1	5.6	6.4	120	6.4	8.6	5.6	4.8
46	6.4	5.6	5.6	7.9	122	6.4	5.6	7.9	5.6
48	6.4	6.4	6.4	6.4	124	6.4	5.6	7.1	6.4
50	6.4	5.6	6.4	7.1	126	6.4	7.1	5.6	6.4
52	6.4	4.8	6.4	7.9	128	6.4	8.6	5.6	4.8
54	6.4	4.8	6.4	7.9	130	6.4	7.1	5.6	6.4
56	6.4	7.9	4.8	6.4	132	6.4	5.6	7.1	6.4
58	7.9	4.1	5.6	7.9	134	6.4	7.9	4.8	6.4
60	7.9	4.8	6.4	6.4	136	6.4	6.4	6.4	6.4
62	6.4	5.6	6.4	7.1	138	6.4	6.4	6.4	6.4
64	6.4	6.4	6.4	6.4	140	6.4	7.9	6.4	4.8
66	6.4	6.4	5.6	7.1	142	6.4	7.1	7.1	4.8
68	6.4	7.9	4.8	6.4	144	6.4	8.6	5.6	4.8
70	6.4	4.8	7.9	6.4	146	6.4	7.9	6.4	4.8
72	6.4	7.1	5.6	6.4	148	6.4	8.6	5.6	4.8
74	6.4	7.1	5.6	6.4	150	6.4	7.1	7.1	4.8
76	6.4	7.9	4.8	6.4					



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Item No./Item Name: W21001
Chart Sales Order 509.1-2
Date: 01/31/05

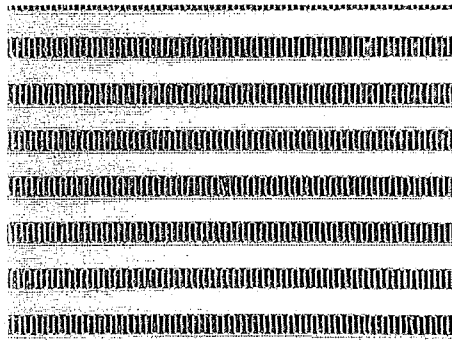
By :Ken Rupp, Senior Principal Quality Engineer

Module 4 Fin Gap Measurements									
Layer #	Gap 1	Gap 2	Gap 3	Gap 4	Layer #	Gap 1	Gap 2	Gap 3	Gap 4
	mm	mm	mm	mm		mm	mm	mm	mm
2	6.4	4.8	6.4	7.9	78	6.4	4.1	7.1	7.9
4	6.4	5.6	7.1	6.4	80	4.8	7.9	6.4	6.4
6	7.9	4.8	6.4	6.4	82	5.6	6.4	7.9	5.6
8	6.4	7.1	5.6	6.4	84	6.4	4.8	7.9	6.4
10	6.4	7.1	7.1	4.8	86	6.4	4.1	8.6	6.4
12	6.4	7.9	6.4	4.8	88	5.6	7.1	6.4	6.4
14	6.4	6.4	6.4	6.4	90	5.6	7.9	5.6	6.4
16	7.9	6.4	6.4	4.8	92	5.6	5.6	7.1	7.1
18	6.4	6.4	6.4	6.4	94	7.9	4.1	7.1	6.4
20	6.4	7.9	6.4	4.8	96	5.6	7.1	5.6	7.1
22	6.4	4.1	7.1	7.9	98	5.6	7.1	6.4	6.4
24	6.4	6.4	6.4	6.4	100	5.6	7.1	6.4	6.4
26	6.4	7.9	6.4	4.8	102	6.4	7.9	4.8	6.4
28	6.4	7.1	7.1	4.8	104	6.4	7.9	4.8	6.4
30	6.4	8.6	5.6	4.8	106	5.6	7.1	6.4	6.4
32	4.8	9.4	6.4	4.8	108	4.8	6.4	6.4	7.9
34	6.4	7.9	6.4	4.8	110	6.4	4.8	8.6	5.6
36	7.9	7.1	6.4	4.1	112	4.8	7.1	6.4	7.1
38	6.4	6.4	6.4	6.4	114	6.4	5.6	7.1	6.4
40	6.4	6.4	6.4	6.4	116	6.4	7.1	6.4	5.6
42	6.4	7.9	5.6	5.6	118	7.1	6.4	7.9	4.1
44	6.4	8.6	6.4	4.1	120	3.8	9.7	4.8	7.1
46	7.9	5.6	7.1	4.8	122	6.4	7.1	6.4	5.6
48	6.4	6.4	6.4	6.4	124	6.4	7.1	7.1	4.8
50	5.6	7.1	6.4	6.4	126	4.8	4.1	8.6	7.9
52	6.4	7.1	7.9	4.1	128	7.1	7.9	6.4	4.1
54	7.9	4.1	7.9	5.6	130	6.4	7.9	6.4	4.8
56	6.4	7.1	7.1	4.8	132	6.4	8.6	4.8	5.6
58	6.4	7.9	6.4	4.8	134	6.4	7.9	6.4	4.8
60	6.4	7.1	6.4	5.6	136	6.4	9.4	4.8	4.8
62	6.4	7.9	6.4	4.8	138	6.4	9.4	4.8	4.8
64	6.4	7.9	6.4	4.8	140	5.6	7.9	6.4	5.6
66	6.4	7.9	6.4	4.8	142	6.4	8.6	4.8	5.6
68	7.9	6.4	6.4	4.8	144	6.4	7.9	5.6	5.6
70	6.4	6.4	6.4	6.4	146	4.8	7.1	6.4	7.1
72	6.4	5.6	7.1	6.4	148	6.4	5.6	6.4	7.1
74	6.4	5.6	6.4	7.1	150	7.1	7.9	4.8	5.6
76	6.4	8.6	5.6	4.8					

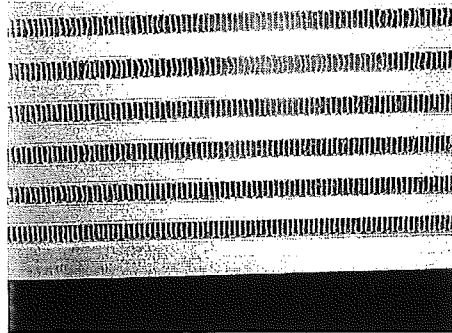


Customer: Air Liquide
Item No./Item Name: W21001
Chart Sales Order 509.1-2
Date: 01/31/05

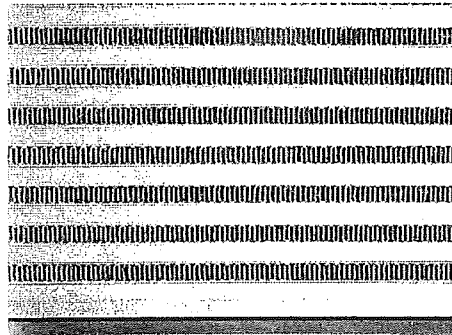
By :Ken Rupp, Senior Principal Quality Engineer



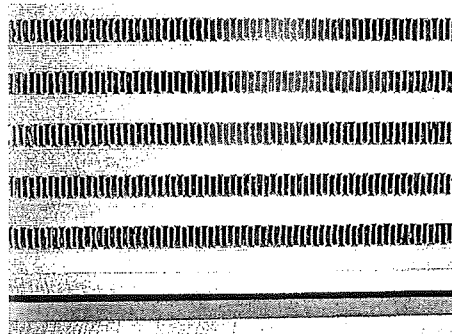
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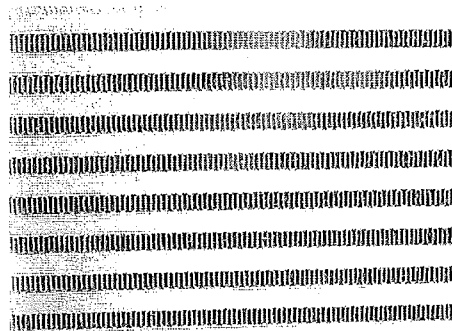
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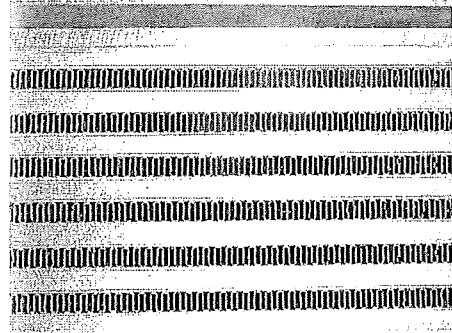
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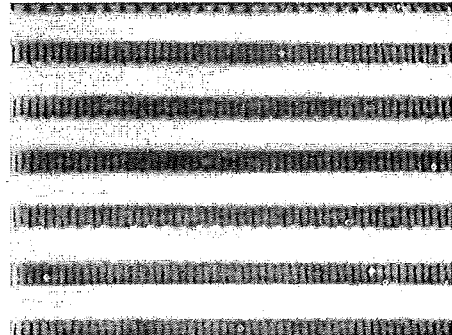
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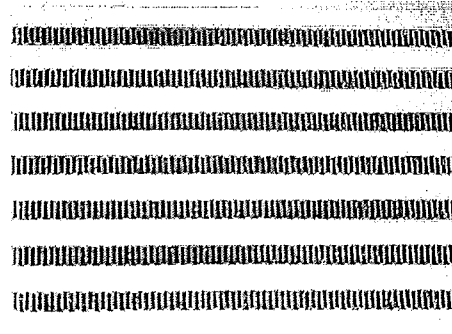
Mod 3 In Top



Mod 3 Out Top



Mod 4 In Top



Mod 4 Out Top